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EXAMINER	
MARKHAM, WESLEY D	
ART UNIT	PAPER NUMBER
1762	

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Please find below and/or attached an Office communication concerning this application or proceeding.

MF-7

Office Action Summary	Application No.	Applicant(s)	
	09/840,552	DOPPER, GEBHARD	
	Examiner	Art Unit	
	Wesley D Markham	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) *24-29* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 April 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *3* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claims 1 – 29 are currently pending in U.S. Application Serial No. 09/840,552, and an Office Action on the merits follows.

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

   I. Claims 1 – 23, drawn to a method of cleaning and/or coating an article, classified in class 427, subclass 534.

   II. Claims 24 – 29, drawn to a device for cleaning an article, classified in class 118, subclass 72.

2. The inventions are distinct, each from the other because of the following reasons: Inventions I and II are related as process and apparatus for its practice, respectively. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case, the apparatus as claimed can be used to practice another and materially different process, such as (1) an ion-beam or electron beam etching process instead of a method of cleaning and/or coating an article, or (2) a process wherein the article to be treated does not have a "metallic base body", as required by the claimed process.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification and

recognized divergent subject matter, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Mr. Werner Stemer on 12/06/2001, a provisional election was made with traverse to prosecute the invention of Group I, Claims 1 – 23. Affirmation of this election must be made by applicant in replying to this Office action. Claims 24 – 29 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Drawings

5. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: "III" in Figure 2. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1 – 23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
8. Specifically, regarding independent Claim 1 (from which Claims 2 – 23 depend), the limitation, "controlling an outgoing flow of electrons coming into contact with the base body by connecting the base body to a reference potential via a switch at a given frequency" renders the claim vague and indefinite. It is unclear from this limitation whether (1) the electrons are "controlled" at a given frequency, or (2) whether the switch switches at a given frequency. Therefore, the scope of Claims 1 – 23 is unclear and the claims are indefinite under 35 U.S.C. 112, second paragraph.
9. The term "few" in Claim 4 is a relative term which renders the claim indefinite. The term "few" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Specifically, it is unclear what the applicant intends the claim to encompass by reciting the limitation "...from a few Hz to a few MHz" (i.e., how many is a few?)
10. Regarding Claims 4 – 6, the limitation, "...controlling an outgoing flux of electrons at a frequency..." renders the claims vague and indefinite. Specifically, it is unclear from the applicant's claim language whether (1) the electrons themselves either have a particular frequency or are "controlled" at a particular frequency, or (2) the

frequency values recited in Claims 4 – 6 refer to a switching frequency of the switch in Claim 1 (from which Claims 4 – 6 depend).

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claims 1 – 12, 14 – 16, and 18 – 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harvey et al. (GB 1 447 754 A) in view of Matthews (GB 2 323 855 A), and in further view of Welch (USPN 4,209,552).

13. Regarding independent Claim 1, Harvey et al. teach a method for cleaning a surface of an article having a metallic base body (page 2, lines 1 – 6 and 72 – 74), the method comprising generating a plasma with electrically positively charged ions, accelerating the ions towards the article, and bringing the ions into contact with the base body for cleaning the base body (page 2, lines 1 – 6, and page 3, lines 58 – 68), directing an electron beam onto the base body (page 2, lines 78 – 97), and controlling the relative electric potential of the substrate (i.e., the base body), the electron source, and the anode so that the base body can be held at either a positive or negative electric potential (i.e., have either a positive or negative bias) depending on whether electron bombardment heating is desired (base body is

relatively positively charged / biased) or ion bombardment cleaning is desired (base body is relatively negatively charged / biased so that the positive ions impinge upon the substrate) (page 2, lines 1 – 6 and 78 – 105, and page 3, lines 118 – 130). Harvey et al. do not explicitly teach that the relative electric potentials are created by controlling an outgoing flux of electrons from the base body by connecting the base body to a reference potential via a switch at a given frequency (i.e., Harvey et al. do not explicitly teach the specific manner in which the relative electric potentials / biases are created / controlled). However, Matthews teaches a similar method / apparatus for cleaning and coating a metallic substrate in which a relative electric bias / potential is created by connecting the substrate to a pulsed D.C. power supply which alternates from positive to negative and thereby allows electron bombardment heating while the sample is positive and ion bombardment while the sample is negative (page 5, paragraph 1, page 8, paragraph 3, and page 9, paragraph 1). This is exactly the situation desired by Harvey et al. (i.e., the ability to switch relative substrate potentials depending on whether electron bombardment heating or ion bombardment cleaning is desired). Further, Matthews teaches that this alternating bias has the advantage of providing additional control of the coating microstructure in the subsequent coating step (page 9, paragraph 1). Therefore, it would have been obvious to one of ordinary skill in the art to utilize the alternating positive / negative substrate biasing process of Matthews in order to achieve the alternating heating / cleaning steps of Harvey et al. with the reasonable expectation of (1) success, as the processes and devices of Harvey et al. and Matthews are

extremely similar, and (2) accomplishing the alternating positive / negative bias situation desired by Harvey et al. as well as providing additional control over the subsequent coating step. In addition, please note that by alternating from a negative substrate bias (i.e., a relatively high number of electrons present in the substrate) to a positive substrate bias (i.e., a relatively low number of electrons present in the substrate), the number of electrons present in the base body must necessarily decrease (i.e., there is an outgoing flux of electrons present in the process of the combination of Harvey et al. and Matthews). The combination of Harvey et al. and Matthews does not explicitly teach that the "reference potential" (i.e., the (D.C.) power supply of Matthews) is connected to the base body via a switch at a given frequency. However, Welch teaches an ion bombardment cleaning process utilized prior to a coating process (i.e., a situation similar to that of both Harvey et al. and Matthews) in which the substrate is electrically connected to a D.C. power supply via a switch so that control over the degree of ion bombardment by application of any desired range of positive or negative voltages can be achieved (Col.4, lines 1 – 20). In other words, Welch teaches that a switch connected to a D.C. power supply can achieve the same objective as a pulsed (i.e., alternating) D.C. power supply (i.e., the embodiment taught by Matthews). Therefore, it would have been obvious to one of ordinary skill in the art to utilize a switch connected to a D.C. power supply (i.e., a "reference potential") in the process of the combination of Harvey et al. and Matthews instead of a pulsed D.C. power supply with the reasonable expectation of achieving similar results (i.e., high control over the ion bombardment cleaning and

the ability to apply any range of negative and positive voltages to the substrate). As no particular frequency is claimed in Claim 1, and the switch / electron control process taught by Welch must inherently operate at some frequency (as desired by the user), the process operates at a "given frequency" as required by applicant's Claim 1.

14. The combination of Harvey et al., Matthews, and Welch also teaches all the limitations of Claims 2 – 12, 14 – 16, and 18 – 22 as set forth above in paragraph 13 and below, including a method wherein / further comprising:

- Claim 2 – The frequency is selected from a fixed preset frequency, an adjustable frequency, and a regulated frequency. Specifically, the frequency desired by Harvey et al. is given (page 2, lines 98 – 105) and thus is "fixed" and "preset".
- Claim 3 – Alternately opening and closing the switch to define an outgoing flux of electrons in an electric outgoing line connected to the base body (see paragraph 13 above, Figure 1 of Matthews, and Figure 2 of Welch, which both show the substrate connected to an outgoing electric line).
- Claim 4 – Controlling an outgoing flux of electrons at a frequency in a range of from "a few Hz" to "a few MHz". Specifically, Harvey et al. teach "a few Hz" (page 2, lines 98 – 105).
- Claims 5 – 6 – The flux is controlled at a frequency of substantially 50 kHz (Claim 5) or substantially 27 MHz (Claim 6). While this is not explicitly taught by Harvey et al., Harvey et al. do suggest that the switching between heating

and cleaning mode (i.e., the controlling frequency) can vary and be chosen by the purveyor in the art (page 2, lines 98 – 105). Therefore, absent any showing of criticality or unexpected results, it would have been obvious to one of ordinary skill in the art to optimize the controlling frequency through routine experimentation.

- Claim 7 – The flux of electrons is controlled such that a bias voltage of substantially between 100 V and 1000 V is established between the plasma and the base body (page 3, lines 119 – 130 of Harvey et al.).
- Claim 8 – Determining a bias voltage between the electrically positively charged ions of the plasma and the base body (page 3, lines 119 – 130 of Harvey et al.).
- Claim 9 – The plasma is generated with the electron beam. Specifically, Harvey et al. teach that the electron filament source can be used to both heat the substrate by electron bombardment and generate the plasma (i.e., the "glow discharge") (page 1, lines 83 – 87, and page 2, lines 78 – 91).
- Claims 10 – 12 – The plasma is formed with an inert gas, specifically a noble gas, specifically argon (page 2, lines 1 – 10 of Harvey et al.).
- Claim 14 – Heating the article prior to cleaning. Specifically, Harvey et al. teach alternately heating and cleaning (page 2, lines 98 – 105), which suggests a cycle of heating – cleaning – heating – etc. (i.e., the article is heated prior to cleaning in performing the alternating steps taught by Harvey et al.).

- Claim 15 – Heating the article by irradiation with electrons (page 3, lines 125 – 126 of Harvey et al.).
- Claim 16 – Concurrently with cleaning the article, heating the article to "a coating temperature". Specifically, Harvey et al. teach alternately heating and cleaning (page 2, lines 98 – 105). The substrate may also be heated by the ion bombardment of the cleaning (page 2, lines 78 – 80). In addition, the applicant's claim simply recites heating the article to "a coating temperature" (i.e., not a specific coating temperature or a coating temperature utilized in a subsequent coating step), and therefore Harvey et al.'s teaching of heating in general reads on heating to "a coating temperature" (i.e., any temperature).
- Claims 18 – 19 – The article is a gas turbine component (Claim 18), specifically a turbine blade or a heat shield (Claim 19). Harvey et al. teach a turbine blade (page 2, line 74).
- Claim 20 – Rotating the article about an axis of rotation (page 2, lines 106 – 113, and page 3, lines 81 – 83 of Harvey et al.).
- Claim 21 – Subsequently coating the cleaned article with a protective layer using a PVD process (page 3, lines 1 – 38 of Harvey et al.).
- Claim 22 – Prior to cleaning, heating the article to a given temperature, and after cleaning and prior to coating, heating the article to a defined coating temperature. Specifically, Harvey et al. teach alternately heating and cleaning prior to coating (page 2, lines 98 – 105), which suggests a cycle of heating – cleaning – heating – etc. (i.e., the article is heated both prior to cleaning and

after cleaning in performing the alternating steps taught by Harvey et al.). In addition, the applicant's claim simply recites heating the article to "a defined coating temperature" (i.e., not a specific coating temperature or a coating temperature utilized in a subsequent coating step), and therefore Harvey et al.'s teaching of heating in general reads on heating to "a defined coating temperature" (i.e., any temperature desired by the purveyor in the art).

15. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harvey et al. (GB 1 447 754 A) in view of Matthews (GB 2 323 855 A), in further view of Welch (USPN 4,209,552), and in further view of Rickerby (USPN 5,652,044).

16. The combination of Harvey et al., Matthews, and Welch teaches all the limitations of Claim 13 as set forth above in paragraphs 13 – 14, except for a method wherein the plasma is formed with the reactive gas hydrogen. Specifically, Harvey et al. teach forming the plasma with argon for the ion cleaning process (page 2, lines 1 – 10). Rickerby teaches that, in the art of ion / plasma cleaning of turbine blades prior to coating (i.e., a process analogous to that of both Harvey et al. and Matthews), the use of an argon-hydrogen plasma may be used to provide enhanced cleaning when compared with an argon plasma alone because the additional hydrogen ions chemically react with undesired contaminants on the substrate (Col.10, lines 16 – 35). Therefore, it would have been obvious to one of ordinary skill in the art to utilize an argon-hydrogen plasma (i.e., a plasma formed with the reactive gas hydrogen) as taught by Rickerby in the process of the combination of Harvey et al., Matthews,

and Welch with the reasonable expectation of (1) success, as Rickerby teaches process analogous to that of both Harvey et al. and Matthews, and (2) obtaining the benefits of using the argon-hydrogen plasma of Rickerby as opposed to the argon plasma of Harvey et al., such as enhanced cleaning of the substrate because the additional hydrogen ions chemically react with undesired contaminants on the substrate.

17. Claims 17 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harvey et al. (GB 1 447 754 A) in view of Matthews (GB 2 323 855 A), in further view of Welch (USPN 4,209,552), and in further view of Frye et al. (USPN 4,380,865).
18. The combination of Harvey et al., Matthews, and Welch teaches all the limitations of Claims 17 and 23 as set forth above in paragraphs 13 – 14, except for a method wherein, during the alternating heating / cleaning steps of Harvey et al. and prior to the coating step of Harvey et al., heating the article to a temperature of over 800° C, so long as the coating temperature lies above 800° C and the temperature during the heating / cleaning cycle of Harvey et al. lies above the coating temperature. Please note that that Harvey et al. teach a coating temperature of above 800° C, as required by Claim 23 (page 2, lines 69 – 77). Harvey et al. are silent as to the temperature utilized during the alternating heating / cleaning steps prior to the coating step. However, Harvey et al. do teach utilizing argon ion cleaning of the substrate (which alternates with electron bombardment heating) prior to an electron

beam coating step (page 2, lines 1 – 10 and 98 – 105, and page 3, lines 1 – 38). Since Harvey et al. are silent as to the temperature utilized during the heating / cleaning cycle(s), one of ordinary skill in the art would have been motivated to utilize an operable argon ion cleaning / heating temperature in the process of Harvey et al. Frye et al. teach that a suitable temperature utilized during an argon ion cleaning process is 850° C (Col.8, lines 55 – 58). It would have been obvious to one of ordinary skill in the art to utilize this temperature during the heating / cleaning cycle of Harvey et al. with the reasonable expectation of success, as (1) Harvey et al. teach argon ion cleaning and Frye et al. teach that argon ion cleaning can be achieved at a substrate temperature of 850° C, and (2) Harvey et al. teach that the substrate of their process can withstand temperatures of above 850° C (i.e., up to at least 1200° C) (page 2, lines 75 – 77). Further, one of ordinary skill in the art would have been motivated to utilize this substrate temperature since Harvey et al. are silent as to the substrate temperature during the heating / cleaning process and Frye et al. teach an operable substrate temperature.

Conclusion

19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Yamazaki et al. (USPN 4,971,667) teach a plasma processing method and apparatus in which a substrate holder is connected to a three-way switch that is further connected to either (1) ground, (2) a voltage source,

or (3) nothing (i.e., the switch is open) so that any one of three states of bias application can be selected (Col.7, lines 1 – 17, and Figure 7).

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley D Markham whose telephone number is (703) 308-7557. The examiner can normally be reached on Monday - Friday, 8:00 AM to 4:30 PM.

21. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (703) 308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

22. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Wesley D Markham
Examiner
Art Unit 1762

WDM
June 17, 2002

MICHAEL BARR
PRIMARY EXAMINER